

**Master 2 internship project
Year 2023-2024**

Laboratory/Institute: TIMC (CNRS UMR 5525-/Université Grenoble Alpes/VetAgro'Sup) and Laboratoire de Bactériologie et d'Hygiène Hospitalière (Institut de Biologie et de Pathologie, CHU Grenoble) **Directors:** Alexandre Moreau Gaudry (TIMC) and Max Maurin (Laboratoire de Bactériologie)

Team: TIMC TrEE (Translational microbiology - Evolution - Engineering) **Heads of the team:** Fabien Pierrel and Bertrand Toussaint

Name and status of the scientist in charge of the project: Elena BUELOW, Researcher

HDR: yes ☐ no ☒

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Program of the Master's degree in Biology:

- ☒ Immunology, Microbiology, Infectious Diseases ☐ Structural Biology of Pathogens
☐ Physiology, Epigenetics, Differentiation, Cancer ☐ Neurosciences and Neurobiology

Title of the project:

Monitoring antibiotic resistant pathogens in hospitals by metagenomic characterization of sink and hospital wastewater biofilms in comparison with conventional culturing methods

Objectives (up to 3 lines):

In the context of the "one health" approach, the proposed project will correlate 1/microbiota and resistome composition of sink and hospital WW biofilms to 2/ incidence of infections and 3/ antibiotic treatment and medication at CHUGA.

Abstract (up to 10 lines):

The proposed research project aims to improve existing surveillance of antibiotic resistant bacteria (ARB) in hospitals by combining culture dependent approaches with omics data. Biofilms that form in the sink or in shower drains of hospital wards potentially contain nosocomial pathogens or ARB, that could be transmitted to patients. Furthermore, hospital wastewater (WW) that collects the feces of patients may indicate the level of pathogen contamination in the patient microbiota, including ARB. Specifically, hospital WW biofilms are important hot spots for the accumulation of pathogens and the dissemination of antibiotic resistance genes (ARGs). However, until today, biofilms from the hospital environment are not part of routine diagnostics for the monitoring of ARB and nosocomial pathogens at CHUGA. Here we will study hospital WW and sink biofilms by culture-dependent and omic approaches to correlate our data to the infection rate and consumption of antibiotics at the hospital to better estimate infection transmission risks.

Methods (up to 3 lines):

Characterization of biofilms (hospital WW and sink biofilms) by conventional and optimized culturing techniques; analysis of the biofilm microbiota by full-length 16S rRNA sequencing; "resistome" analysis by targeted high-throughput qPCR; analysis of the infection rate and consumption of antibiotics at the hospital.

Up to 3 relevant publications of the team:

Buelow *et al.*, FEMS Microbiol Ecol., 2018; Buelow *et al.*, Water Res X., 2020; Buelow *et al.*, Water Res., 2023

Requested domains of expertise (up to 5 keywords):

Microbiology, molecular biology, bioinformatic analysis of sequencing data, statistical analysis